C-AD Radiobiology User Training

NSRL Experimental Support Building (Bldg 958)

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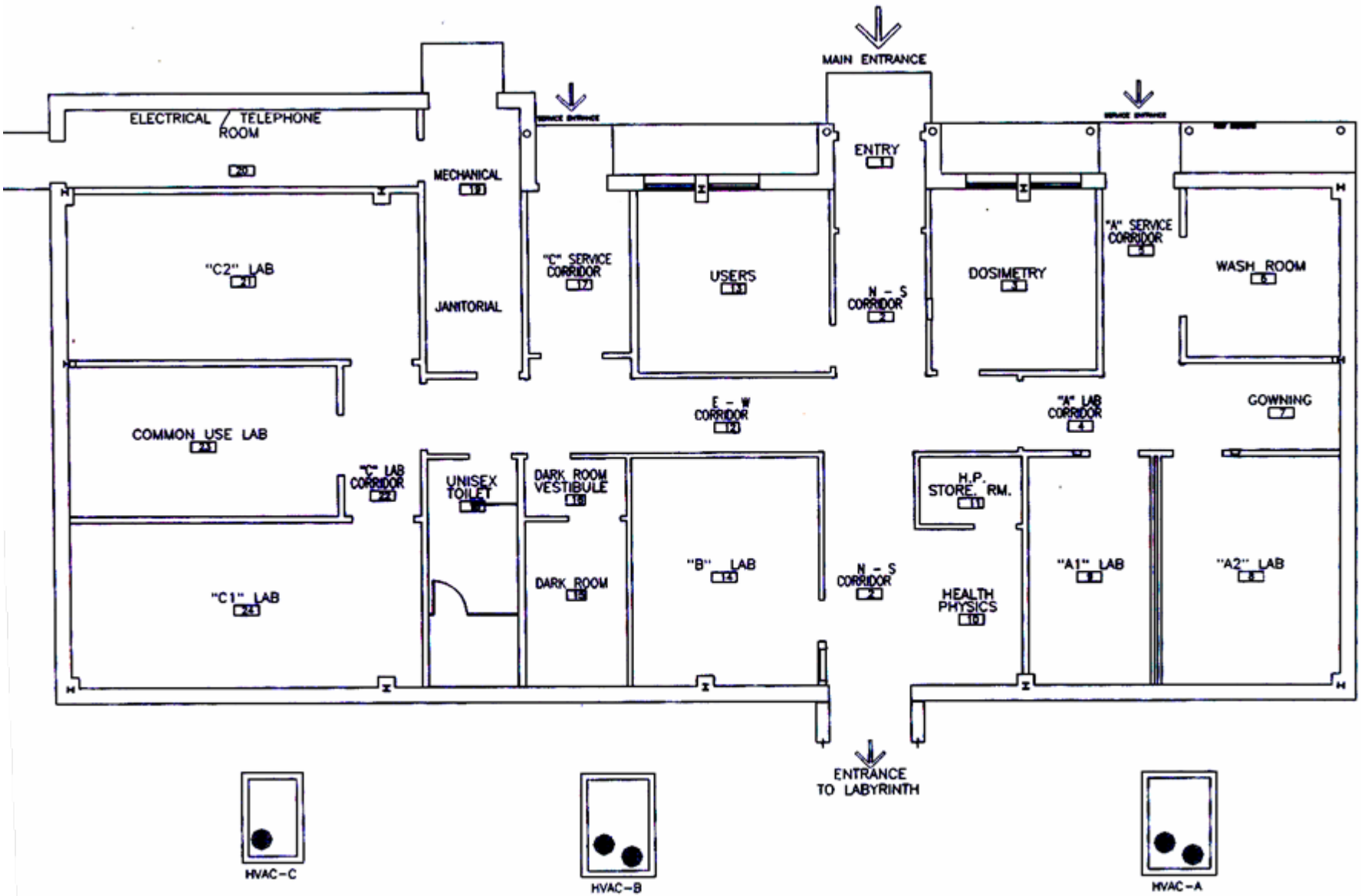


C-A Conduct of Operations

- Written procedures exist for most operations
- Use of qualified and trained personnel
- Appropriate authorizations and work permits before starting a job or operations
- Definitive lines of authority:

  On-duty Operations Coordinator (x4662) is responsible for safe operation of accelerator complex during operating periods

  Maintenance Coordinator is responsible for safe operation and coordination during shut down periods

C-AD Contacts

Liaison Physicist

Adam Rusek 5830

Liaison Engineer

Dave Phillips 4671

Training

Radiobiology Users :

All: (minimum for Target Room access & access to Bldg 912)

- BNL Radiation Worker
- C-AD Radiobiology User Training

Examples of other training requirements (depending on work activities):

- Lab Standard
- Hazardous Waste Generator
- Regulated Medical Waste Generator
- Bloodborne Pathogens Awareness
- Dispersible On-the-Job Training (OJT) demonstration
- Radioactive Waste Generator
- Cryogen Safety Training
- Compressed Gas

Working with Benchtop Dispersibles

Satisfactory completion of this course as well as an On-the-Job Training (OJT) demonstration with the Facility Support Representative will provide limited qualification to perform dispersibles work at NSRL and Bldg 490. The dispersibles work will be conducted in properly posted areas under the control of a Job-Specific Radiological Work Permit (RWP) and RCT coverage. The dispersible work is limited only to sample activity associated with beam irradiation. Dispersible work with samples radio-labeled prior to irradiation requires the full BNL Benchtop/Dispersibles Course (RWT-500).

This training does not qualify you to work with dispersibles at any other facility at BNL.

Note: Opening the container top to allow CO^2 to enter the sample container while in the incubator does not constitute work with dispersibles.

ACCESS CONTROL SYSTEM

ACCESS PROHIBITED

CONTROLLED ACCESS

RESTRICTED ACCESS

ACCESS CONTROL SYSTEM

Designed for Radiation Protection

- During Restricted Access Mode: Use orange card-key

- During Controlled Access Mode: Get key from key-tree


BEAM!
DANGER
DANGER
AC POWER


AC POWER
KEYGARD


KeySafe
KEYTRAK
KeySafe MAX
08:28:56 THU 28 FEB
1
2
3
4
5
6
7
LOCAL KEY TREE COMPLETE (A & B DIVISIONS)
9
10
11
12
13
14
15
SWEEP KEY
KEY #1 OUT
KEY #2 OUT
KEY #3 OUT
KEY #4 OUT
KEY #5 OUT
KEY #6 OUT
KEY #7 OUT
24
25
26
27
28
29
30
31
SWEEP KEY OUT
33
34
35
36
37
38
39
40
KEYTRAK
KEYGARD


BGE1
BEAM ENABLE
CONTROLLED ACCESS
RESTRICTED ACCESS
SAFE ACCESS
AREA SECURED
GATE RESET
RELEASE ACTIVE
Allen-Bradley
HID
EDGE READER
BGE1

Remote Access Video

Show Video

(To show video, reduce PowerPoint presentation an click on Icon for video on the desktop.)

Posting on target room door

RADIOACTIVE MATERIALS AREA

ACTIVATION CHECK REQUIRED

This posting means you must not release items from the area without checking for activation.

Contact a Radiological Control Technician (RCT) to perform activation check. An RCT is typically located at NSRL Bldg 958 during experimental runs.

Access Control Modes - Summary

Green Light - RESTRICTED ACCESS

NSRL: Use orange card-key for entry

(use 256 key if at AGS Bldg 912)

Yellow Light - CONTROLLED ACCESS

MCR controls & monitors access.

Get Key from Key Tree

To enter: Call MCR; be observed by video

To exit: Call MCR; be observed by video

Red Light - ACCESS PROHIBITED

This mode means that beam is on

or is about to be turned on.

Access is PROHIBITED

Multiple people entering with one opening of the door (essentially the same rules apply)

1) CONTROLLED ACCESS MODE

At the discretion of the on-duty Operations Coordinator, up to 5 people may be permitted through the access door with one opening of the door.

THE FOLLOWING APPLIES:

- Each individual scans their irises and pulls their own key from the key tree
- At the door, contact MCR and request access
- Inform MCR of how many people would like to enter with one opening of the door
- The Operator decides whether or not they will allow multiple people to enter with one opening of the door
- Assuming the Operator is allowing multiple people to enter, each individual must be identified to the MCR operator (Note: The Operator is entering each individual's name onto a log sheet. This is completed prior to the gate being released and may take a few minutes.)
- Get simultaneous release indication from MCR
- One individual presents their RFID tag (attached to the key) to the edge reader (distance of about 1 1/2 inches)
- Each individual shows their key to the camera (MCR Operator) as they enter

Multiple people entering with one opening of the door (essentially the same rules apply)

(cont'd)

2) RESTRICTED ACCESS MODE

During Restricted Access Mode, more than one person may enter through the door with one opening of the door provided each individual still scans their own access card (orange card) on the card reader key pad and the small green light on the card reader comes on.

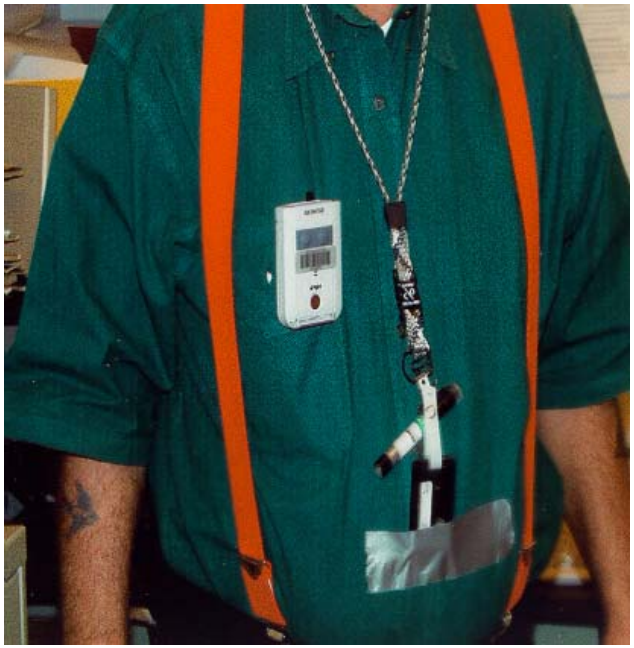
Beam Imminent Alarm

<u>NSRL Target Room</u> (or AGS Bldg 912 Target Rooms)

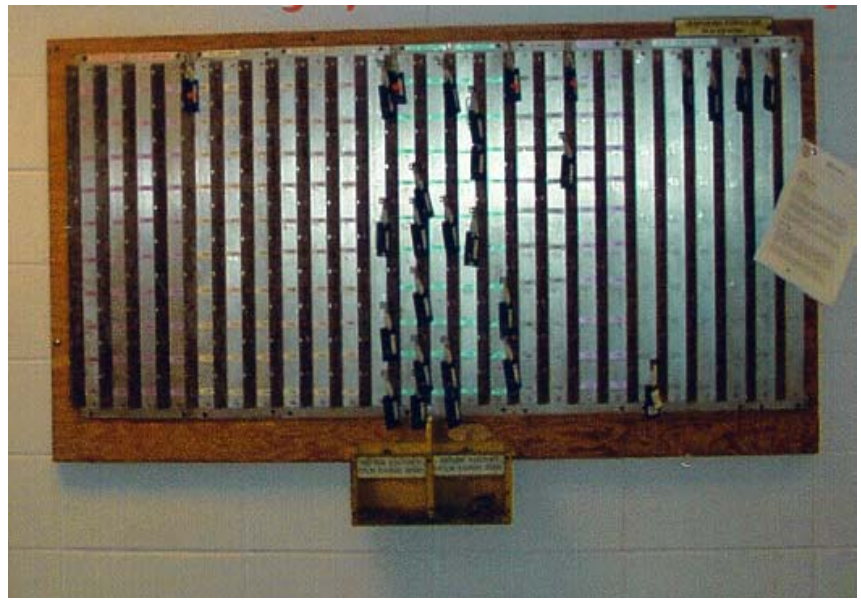
- **Lights dim**
- **Audible announcement**

ThermoLuminescent Dosimeter (TLD)

Wear TLD on torso between neck and waste.



Return your TLD to a badge board at BNL when not in use; low background area



<u>Your TLD</u>:
a) monitors your radiation exposure and is your legal record
b) is exchanged monthly
c) must be returned to a badge location at BNL when not in use

Radiological Work Permit (RWP)

- RWP not required for access to NSRL support building

- RWP not required for access to NSRL Target room at this time

- RWP REQUIRED for working with Dispersibles (dispersible radioactive material) at NSRL or at Bldg 490

- RWP also required for entry into Radiation Areas or High Radiation Areas. Several areas throughout C-AD are posted Radiation Area or High Radiation Area.
  (example: AGS Bldg 912 slow extraction beam-line (SEB) target rooms)

C-AD Administrative Control Levels (ACLs)

Period	Maximum Individual Dose ACL (mrem)	Individual Dose ACL with Line Authority Approvals (mrem)
Calendar Year	1000	1000 to 1250 (C-AD Chair Approval)
		1250 to 2000 (Lab Director Approval)
Daily	100	100 to 200 (Approval will be on RWP)

C-AD Escort Policy

CONTACT C-AD ESHQ Division:

John Maraviglia	(x7343)
or	
Ray Karol	(x5272)
or	
Asher Etkin	(x4006)

Contamination Control Work Habits
(for those qualified and working with dispersibles)

- Use of absorbent materials in hoods when working with liquids
- Holding absorbents under samples while transporting from primary area to work area
- Frequent surveys of work area
- Establish a small trash receptacle on the benchtop to minimize the transfer of contaminated materials across the work space
- Housekeeping: store excess materials outside of the work area
- Self-frisking

Note: If you encounter contamination on skin or clothing > 100 counts per minute above background on a GM “Frisker”, stop work, place work area in a safe condition, notify others in the work area, and **notify a C-AD Radiological Control Technician (RCT)**. An RCT is typically located at NSRL BLDG 958 during experimental runs.

Contamination

Examples of materials that may cause a contamination incident:

- Accidental spill of biological target material after irradiation
- Small pieces of broken or disintegrated beam line instrumentation or target material
- The contents of fire extinguishers or gas cylinders that reside in primary areas during beam operations

Price-Anderson Amendments Act (PAAA)

Failure to comply with safety rules (radiological or other), or failure to identify and report non-compliances to DOE, subjects the Laboratory to enforcement action.

Worker Responsibilities include:

- Comply with requirements
- Report non-compliances
- Obey Stop Work Orders

WARNING

Willful or flagrant disregard of safety requirements may result in disciplinary and enforcement action.

Work Plan & Experiment Reviews

Screening for ES&H hazards

Experimental runs are screened for ES&H hazards. Users must **Read & Sign** a work plan document prepared for the specific experimental run. Information about the work plan document may be obtained from your:

Experiment Spokesperson, or

C-AD Liaison Physicist

Experiment Reviews –

All experiments and experimental support equipment must be reviewed by the C-AD Experimental Safety Review Committee (ESRC). It is extremely important that once approved, an experiment may not be changed or added-to without re-review and approval. If you have questions, contact your:

Liaison Physicist,

Liaison Engineer, or

the ESRC Chairperson.

Unplanned changes or additions may result in last minute delays for review and approval.

Any material placed in or near the primary beam needs to be reviewed by the ESRC and the ALARA Committees for gaseous or particulate releases that could contaminate the area, equipment or personnel, and must be reviewed for potential overheating.

ES&H: Environment, Safety & Health

Radiation Barriers

When are you permitted to climb over or defeat barriers?

NEVER

Electrical Safety Training

This course does **not** allow you to work on energized equipment or electrical circuits that are powered through circuit breakers, disconnect switches and/or fuses.

Electrical equipment must be de-energized and LOTO'd (Locked Out and Tagged Out) in order to perform work on them. In some rare circumstances, and in accordance with strict procedures, it may be necessary to work on, or test, equipment while energized.

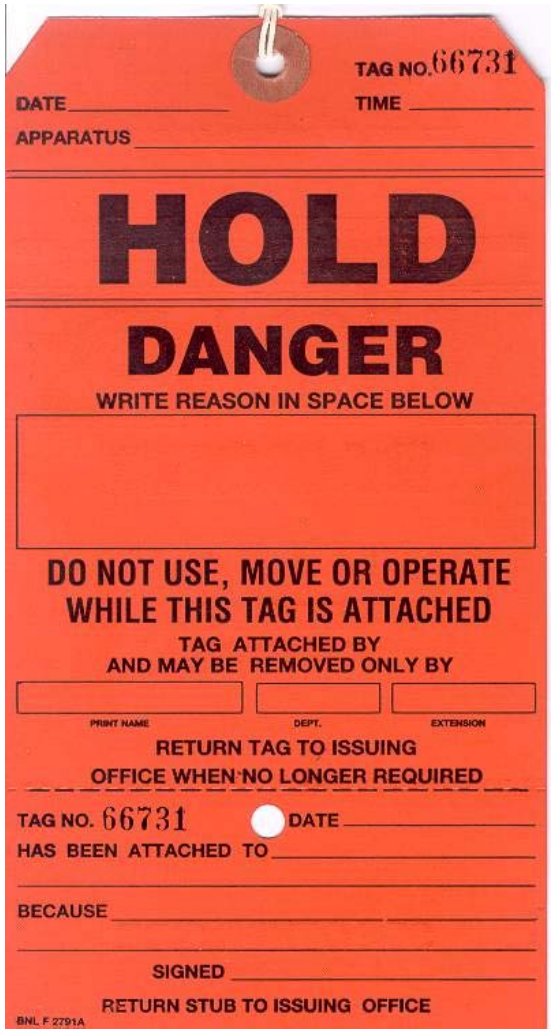
All workers performing LOTO or other electrical work must have the appropriate BNL & C-AD training, and C-AD authorization.

Consult with your Liaison Physicist for details if you may need to perform electrical work.

LOTO: Lockout/Tagout

Used for Personnel Protection

- Typical LOTO Lock



- Typical LOTO RED Tag

NEW Electrical Safety Requirements
(NFPA 70E)

NFPA: National Fire Protection Association
70E: Electrical Safety in the Work Place

Newest Concern: ***Electrical Arc Flash Hazards***
(in addition to the already existing concern of electrocution)

In U.S., 8 to 10 people per day are sent to burn unit due to arc flash, mostly from low voltage (120 V) equipment with high fault-current capability

Biggest Impact to Users: Personal Protective Equipment (PPE) required during breaker or switchgear operation

Working on or near live equipment (including breaker/switch operation) is not permitted without the proper training & PPE

This may slow jobs down, but we must comply with NFPA 70E

Radiation Safety (RS) LOTO

Access Control System Equipment (Orange tag)

Do not touch tagged equipment. Contact MCR.

CHIPMUNKS AREA RADIATION MONITORS

SET UP LIKE STOP LIGHTS
RED BLINKING LIGHT FOR GREATER THAN 20mrem/hr
YELLOW BLINKING FOR GREATER THAN 2 mrem/hr
DATA IS STORED AND CAN BE USED TO ESTIMATE DOSE
INTERLOCKS AT HIGH DOSE

Transport of Rad Materials

Radioactive materials transferred between C-AD and Medical or Biology must be transported in government vehicles.

Radioactive materials leaving the building shall be tagged as Radioactive Material (RAM) by a RCT.

IF YOU ARE SHIPPING MATERIALS FROM C-A TO OFF SITE, THEN ASK YOURSELF THESE QUESTIONS

IS THE ITEM RADIOACTIVE ?

To check if items are radioactive contact Health Physics x 4660. Radioactive Materials must be shipped through the
Isotope and Special Materials Group x 5223.

DOES THE ITEM CONTAIN HAZARDOUS MATERIAL?

Contact C-AD Environmental Coordinator x 7520. Hazardous materials must be shipped through the BNL *Hazardous Waste Management Group*
or Supply and Material Group .

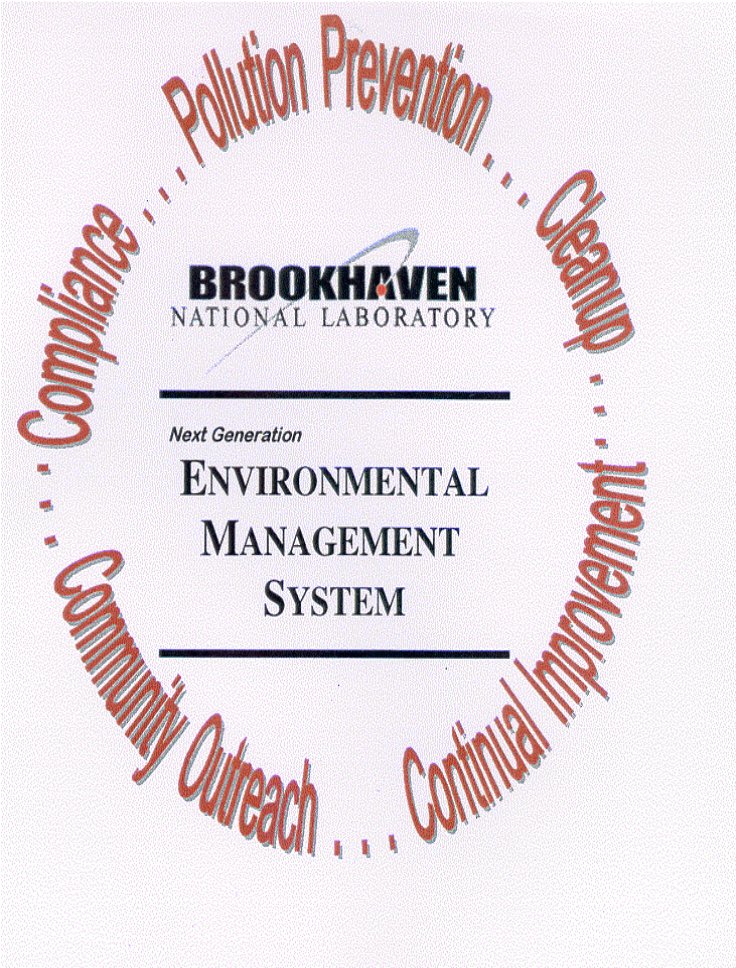
DOES THE ITEM CONTAIN BIOLOGICAL MATERIALS?

Contact Experimental Spokesperson Peter Guida
(Backup contact: Bob Colichio x8440)

Still Unsure? Then contact:

Liaison Physicist Adam Rusek x 5830

Waste Disposal



Improper disposal of radioactive or hazardous waste may result in fines, criminal prosecution, and facility shutdown.

- Contact the C-A Environmental Coordinator (x7520) for information on any waste.
- Contact the C-AD Environmental Compliance Representative (ECR x2905) prior to establishing any airborne, liquid, or solid radioactive or hazardous waste stream.

<u>Note</u>: All medical waste is the responsibility of the Experimenter to have it brought back to the Medical Department.

Spill Reporting

• The C-A Department is required to report spills; internally, externally, or BOTH.

• C-AD must report ***quickly*** to external agencies on spills that impact the environment.

• Even minor events, such as spilling any amount of oil in an outdoor area, require reporting.

• If you spill any hazardous or industrial material outdoors on the ground, or anywhere inside and the spill is beyond your control, call x2222 or 911 to report the spill. Then call:

> C-AD Main Control Room (x4662), the C-AD ESHQ Division Head (x5272) or the C-AD Environmental Coordinator (x7520).

• For any spill, notify your Experiment Spokesperson and/or your Liaison Physicist.

• Do not leave a message on an answering machine as notification.

• When reporting, give your name and information on the spill location, type of material and approximate amount.

Workers (You, Guests, Visiting Scientists, and Contractors)

All chemicals used in experimental areas must be approved by the C-AD ESH Coordinator (x5940 or x7200).

Chemicals are to be properly stored and disposed of.

Use of Controlled Substances must be approved by the Experimental Spokesperson

Question: When/how may you bring chemicals to C-AD experimental areas?

Answer: by notifying your Experiment Spokesperson before you arrive at BNL.

Material Safety Data Sheets - MSDS

- Name of Chemical
- Manufacturer
- Hazardous Ingredients
- Physical Characteristics
- Fire and Explosion Data
- Reactivity Data
- Health Hazard Data
- Safe Handling Data
- Safety Control Measures

Available from the C-AD ES&H Coordinator

Compressed Gas Cylinder Handling

Note: Additional training would be required (a web-based course) if you needed to work with compressed gas

Some General Rules:

- Do not drop cylinders or permit them to violently strike each other
- Do not roll cylinders in a horizontal position
- Do not drag cylinders
- Do not handle cylinders with oily hands or gloves (This is especially important when handling oxygen and other oxidizers)
- If hoisting is necessary, use a suitable cradle or platform
- Do not lift cylinder by its cap
- Keep cylinder caps on the cylinder whenever they are not in use
- Transport cylinders using a cart or hand truck designed for that purpose

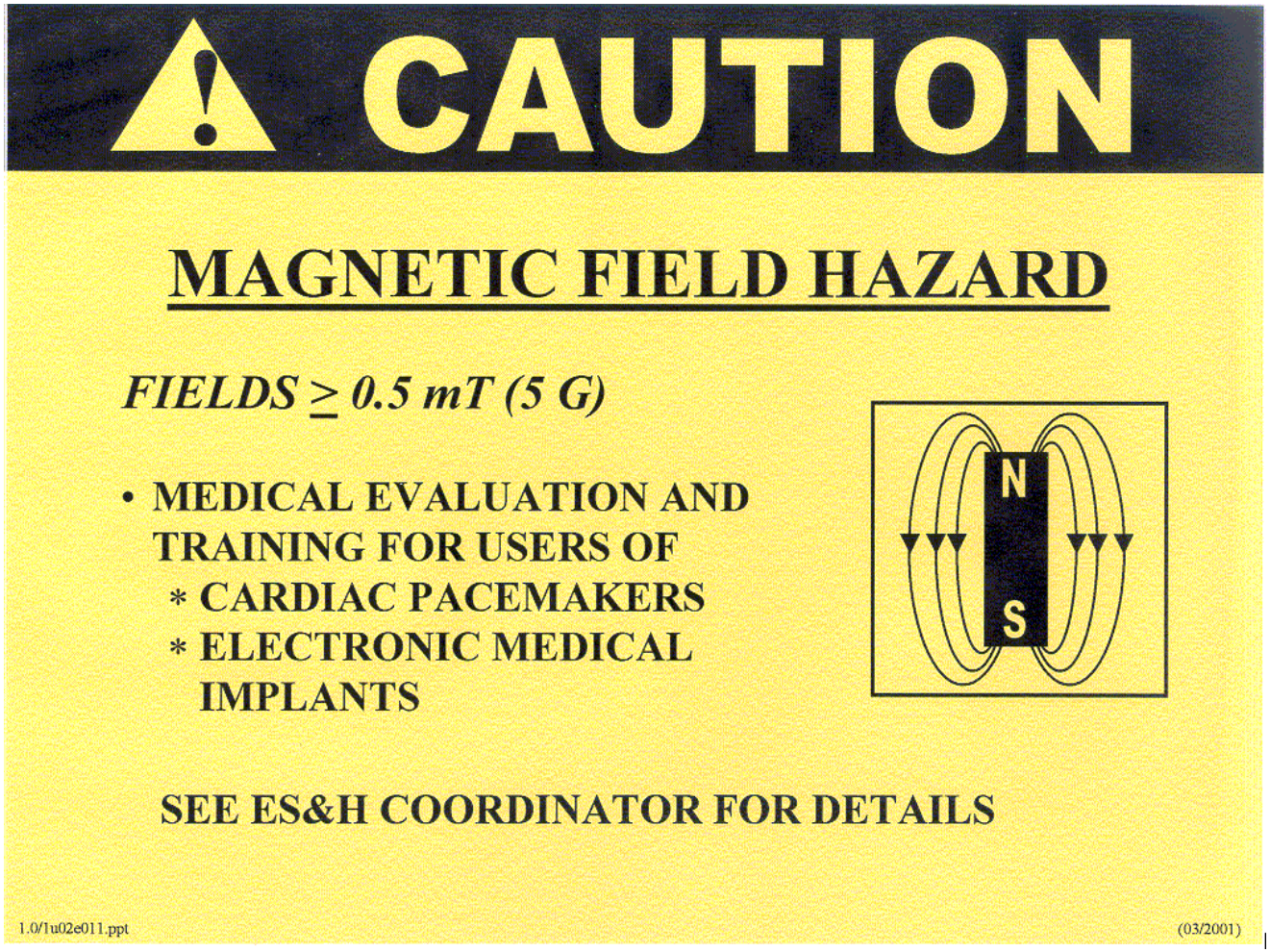
LEAD

If you need to work with lead, then Contact the C-AD ESH Coordinator

- **No handling of the bare metal**
- **Use Gloves**
- **Use Safety Shoes**

Magnetic Field Hazards

Typical posting at Bldg 912 shown below



Note: The NSRL Target Room is not posted for magnetic field hazard

Emergency (Injury / Illness)

- If there is an emergency such as an illness or injury, pull a fire alarm pull-box (if one is in the area) and call 911or 2222.

  From a cell phone: 344-2222 (area code is 631).

- If you are injured, report as soon as possible to the BNL Occupational Medicine Clinic (OMC), located in building 490.

Please note the following lesson learned from an arc flash injury at the STAR Experimental Area. This is not intended to imply any fault with the C-AD staff who participated in the emergency and acted as best as they saw fit at the time.

- **Unless an injury is very minor:**
- **Never** transport the injured person to the Clinic yourself; wait for the Fire/Rescue Department to arrive with the EMT and ambulance. Make sure you pull the Fire Alarm box (if one is in the area) to immediately let Fire/Rescue know the location of the problem. Still follow up immediately with a call to 2222 or 911 (on a cell phone: 344-2222) to let F/R know it is an injury so the EMT/ambulance are dispatched to the scene (they usually don't send the ambulance for a fire only).
- If you transport the person yourself, time may be wasted in having the ambulance track you down.
- In addition, you may be stuck with an injured person who passes out or stops breathing, etc., on the way to the Clinic or you could be nervous and have an accident on the way to the Clinic.

For a minor non-emergency injury, report as soon as possible to the BNL Occupational Medicine Clinic (OMC), located in building 490.

Alarm Signals

Response to Continuous or Intermittent Fire Bell
(metal “clanging” type bell)

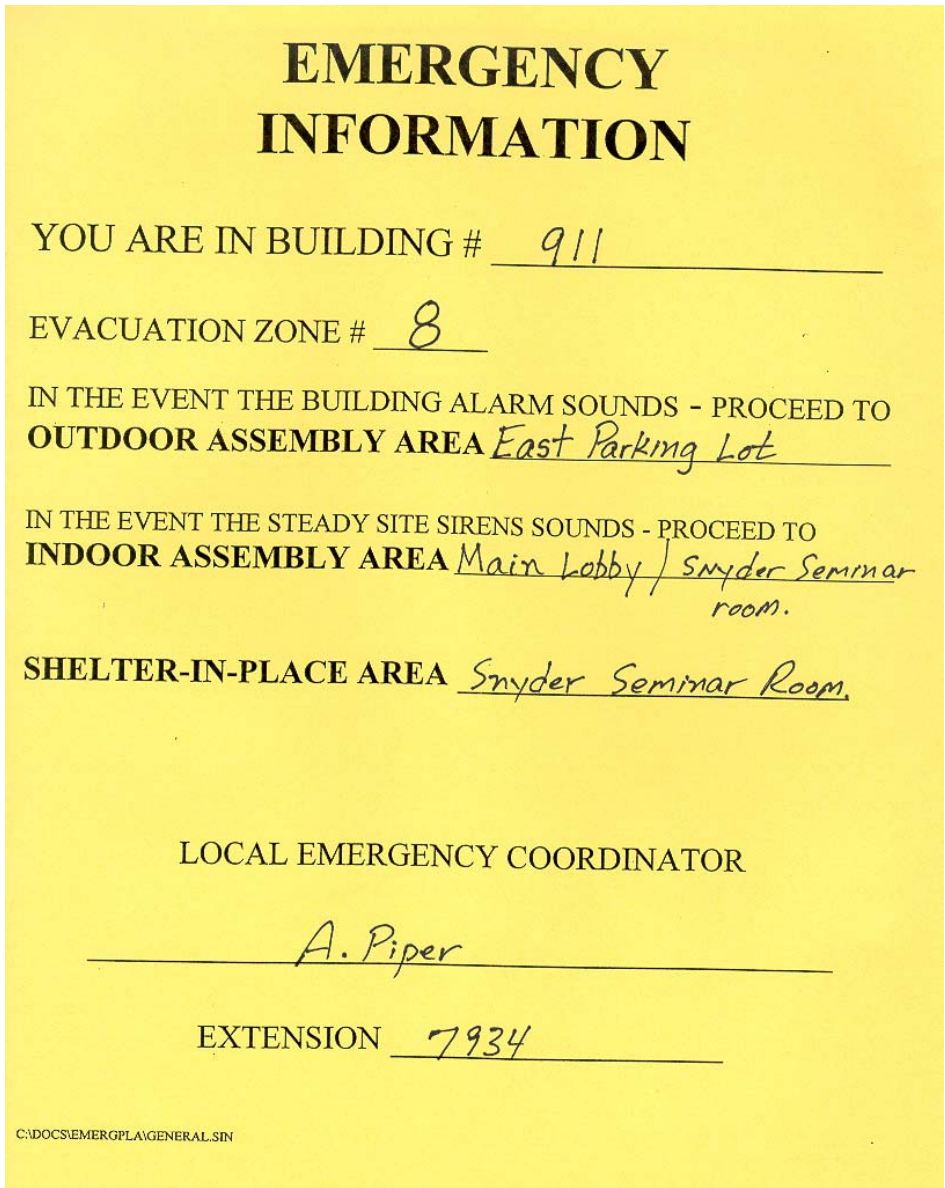
- Exit the area, report to the outdoor assembly area

Response to Beam Immanent Signal
(lights dim or go out, along with an audible announcement)

- If in the Primary Area … Push crash button or exit though access gate; contact MCR

DO NOT RENTER buildings/areas. Wait for further instructions from Fire Captain or ES&H Coordinator.

ASSEMBLY AREA POSTING



EMERGENCY INFORMATION

YOU ARE IN BUILDING # 911

EVACUATION ZONE # 8

IN THE EVENT THE BUILDING ALARM SOUNDS - PROCEED TO
OUTDOOR ASSEMBLY AREA East Parking Lot

IN THE EVENT THE STEADY SITE SIRENS SOUNDS - PROCEED TO
INDOOR ASSEMBLY AREA Main Lobby / Snyder Seminar room.

SHELTER-IN-PLACE AREA Snyder Seminar Room.

LOCAL EMERGENCY COORDINATOR

A. Piper

EXTENSION 7934

C:\DOCS\EMERGPLA\GENERAL.SIN

For NSRL:

Outdoor assembly area is the LINAC parking area

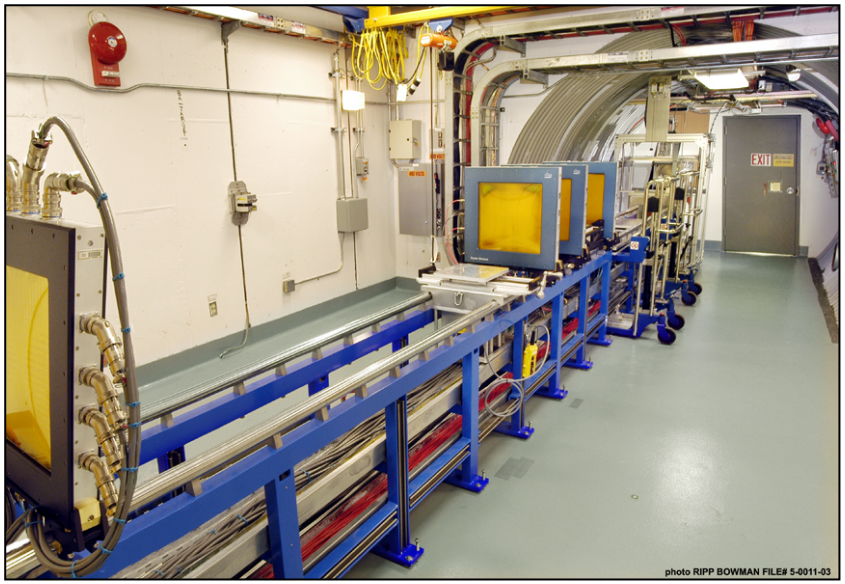
Note Your Surroundings

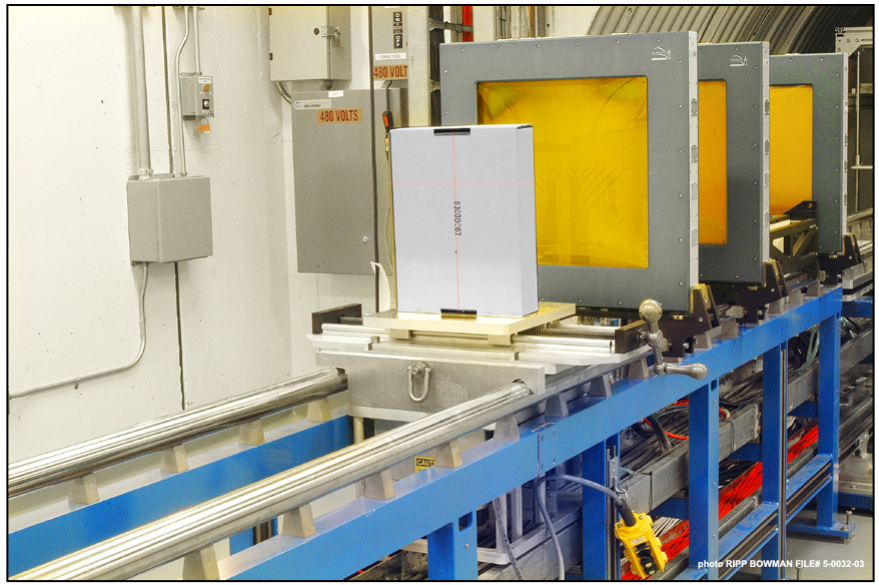
- Exits
- Fire Alarm Pull Boxes
- Intercoms / Telephones
- Crash buttons
- TLD Requirements
- Conventional and Radiological Safety Hazards
- Safety Equipment
- Assembly Areas

STAFFING LEVELS AND SAFETY

Rules shall be followed even when you are short-handed. Do not violate Safety rules to get the job done. Do not use a procedure that you have not been trained on although you feel it will please your supervisor. In short, there are no economics for safety.

Miscellaneous photos





Target Room